

Chapter H7:

Conclusions

EPA examined economic value of impingement and entrainment at J.R. Whiting before net installation (1978-1979) to estimate the losses at the plant without the deterrent net and potential I&E damages at other Great Lakes facilities that do not employ impingement or entrainment reduction technologies. Average annual impingement before net installation was about 21.5 million age 1 equivalents and average annual entrainment was about 1.8 million age 1 equivalents (see Table H3-14). As indicated in Chapter H6, average impingement without the net is valued at between \$351,000 and \$1.2 million per year, and average entrainment is valued at between \$41,000 and \$1.7 million per year (all in \$2000).

The results of EPA's evaluation of I&E rates at J.R. Whiting also indicate that a deterrent net can be very effective at reducing impingement. Facility monitoring data indicate that annual impingement at J.R. Whiting declined an average of 92% over the period 1981-1991 (see impingement data presented in Chapter H3). EPA estimated that the economic benefits of reducing impingement with the net can be substantial, ranging from \$323,000 to \$1.1 million per year (all in \$2000).

EPA also estimated the potential economic benefits of additional technologies that might currently be applied to reduce CWIS impacts at J.R. Whiting (Chapter H6). EPA assumed that no further impingement technology would be required at J.R. Whiting, since the deterrent net appears to minimize impingement to the extent possible. However, EPA estimated that the benefits of 60% entrainment reductions (which may result from installation of fine mesh nets or using passive intake of cooling water) would range from \$25,000 to \$1.0 million per year (all in \$2000).

The upper ends of the valuation of losses and benefits at J.R. Whiting include results of the HRC method for valuing impingement and entrainment losses. HRC-based estimates of the economic value of impingement and entrainment losses at J.R. Whiting were included with the transfer-based estimates to provide a better estimate of loss values, particularly for forage species for which valuation techniques are limited. The HRC technique is designed to provide a more comprehensive, ecological-based valuation of impingement and entrainment losses than valuation by traditional commercial and recreational impacts methods. Losses are valued on the basis of the combined costs for implementing habitat restoration actions, administering the programs, and monitoring the increased production after the restoration actions.

For a variety of reasons, EPA believes that the estimates developed here underestimate the total economic benefits of reducing I&E at Great Lakes facilities (Chapter H6). EPA assumed that the effects of I&E on fish populations are constant over time (i.e., that fish kills do not have cumulatively greater impacts on diminished fish populations). EPA also did not analyze whether the number of fish affected by I&E would increase as populations increase in response to improved water quality or other improvements in environmental conditions. In the economic analyses, EPA also assumed that fishing is the only recreational activity affected and that fishing effort does not increase in response to increases in recreational catch.